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(56) Documents Cited

GB 2319422 A WO 92/11614 A1 US 4630110 A

(58) Field of Search

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(54) Abstract Title

Video surveillance system in which live and previously recorded images may be simultaneously displayed

(57) The invention relates to a method of operating a surveillance system comprising a plurality of video cameras 1-16, a monitor 10 and a video recorder 12. The video cameras and monitor are controlled by a central controller, typically multiplexers 30, 32, 14 which can display multiple cameras on one monitor and also send the information from several cameras to the video recorder 12 by using time division multiplexing (TDM). The central controller is typically built around a microprocessor-based central processing unit (CPU). The system is able to play back 38 recordings from a video recorder, so that recorded images can be examined. The playback of recorded images takes place simultaneously with the ongoing monitoring of live images, and does not interrupt the on-going recording of new images. Input 38 may be connected to video recorder 12 or another recorder.

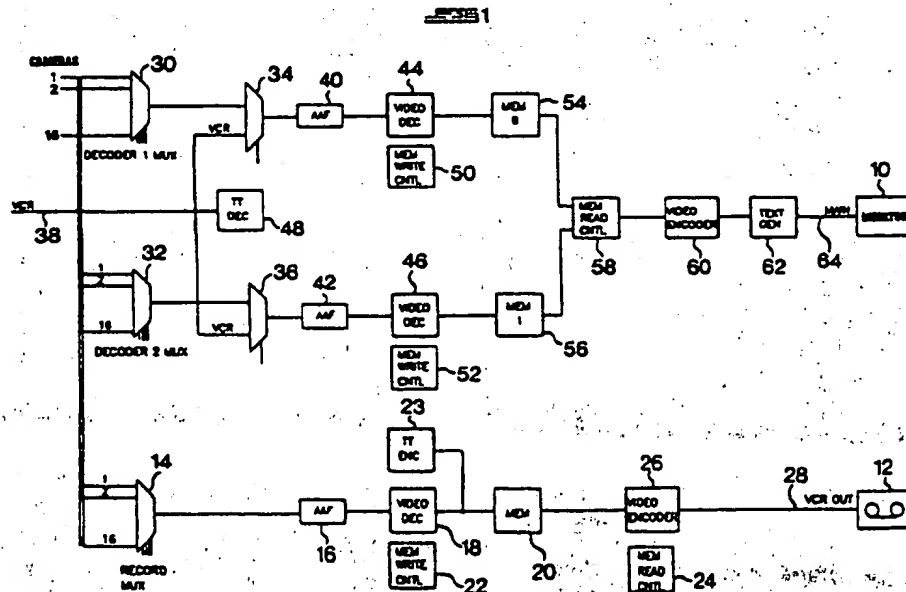
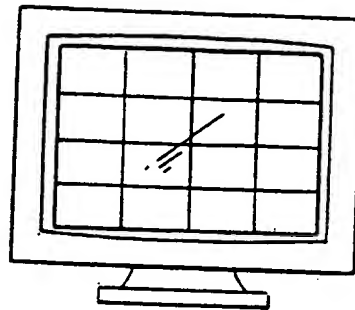


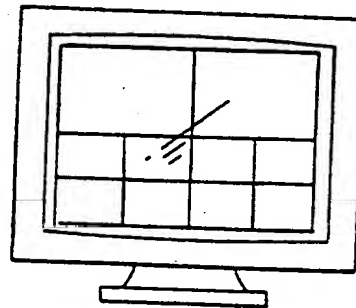
FIG 2A



Playback cameos (8)

Live cameos (8)

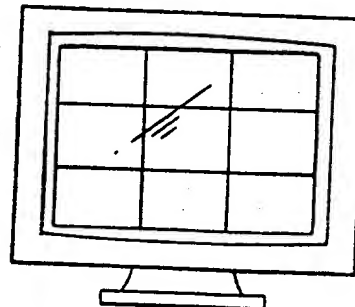
FIG 2B



Playback cameos (2)

Live cameos (8)

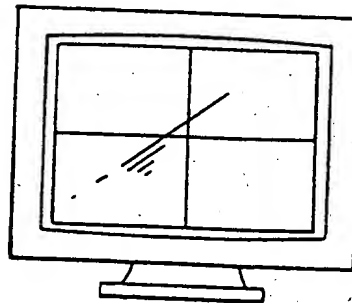
FIG 2C



Playback cameos (3)

Live cameos (6)

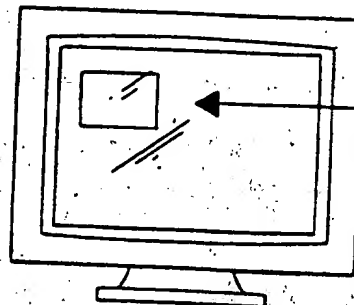
FIG 2D



Playback cameos (2)

Live cameos (2)

FIG 2E



PIP is Live (1)

Full screen is Playback (1)

BACKGROUND OF THE INVENTION

THIS invention relates to a method of operating a surveillance system comprising a plurality of video cameras and to a controller for implementing the method.

Surveillance systems comprising a plurality of video cameras and associated monitors are widely used. The video cameras and monitors are controlled by a central controller, typically a multiplexer which can display multiple cameras on one monitor and also send the information from several cameras to a single video recorder by using time division multiplexing (TDM). The central controller is typically built around a microprocessor-based central processing unit (CPU).

It is also desirable for the system to be able to play back recordings from a video recorder, so that recorded images can be examined, for example to review suspicious events which have been recorded. Preferably, such playback of recorded images should not interrupt the on-going recording of new images, and it is also desirable that such playback take place simultaneously with the ongoing monitoring of live images.

So-called duplex multiplexing systems are known which permit a user to select between the display of live or recorded data while also recording the live data. It is an object of the invention to provide a system which is even more versatile.

SUMMARY OF THE INVENTION

According to the invention there is provided a method of operating a surveillance system having a plurality of video sources, a video monitor, and a video recorder, the method comprising:

selecting outputs of one or more desired sources;

feeding the selected outputs to a video monitor for display as a "live" video image;

feeding an output of a video recorder, corresponding to stored outputs of said one or more desired sources, to the monitor for simultaneous display as a "playback" video image; and

simultaneously feeding said selected outputs to a video recorder for recordal thereof.

The video sources will usually be video cameras, such as surveillance cameras.

Data which identifies the video source may be added to the video output to enable the source to be correctly identified.

The selected outputs may be displayed singly, or together, so that the video monitor displays both "live" and "playback" video images, each of which in turn comprises one or more camera outputs.

Further according to the invention there is provided a controller for a surveillance system having a plurality of video sources, a video monitor, and a video recorder, the controller comprising:

first, second and third input multiplexer means each operable to select a desired one or more of the sources;

a first channel arranged to receive an output from the first input multiplexer means and to generate a video output signal for use by a video recorder; and

second and third channels each arranged to receive an output from either the second or third input multiplexer means, respectively, or an output of a video recorder,

wherein outputs of the second and third channels are combined in a common video output for use by a video monitor, so that the monitor can display both live and recorded video images while the data corresponding to the live images is recorded simultaneously.

Each of the second and third channels preferably comprises a secondary multiplexer for selecting between an output of the second or third input multiplexer means, respectively, or an output of a video recorder.

Each channel may further comprise a signal conditioning and anti-aliasing filter and a video decoder for digitising the output of the signal conditioning and anti-aliasing filter.

Preferably, the first channel further comprises memory means into which the digitised data is written, and a teletext encoder for adding further digital data, such as a number which identifies the video source, to the video data.

The controller preferably further comprises at least one video encoder adapted to reconstruct the digital signal to a standard analog format before it is sent to the video recorder or video monitor.

The controller may further include a decoder adapted to decode the output of the video recorder to the second and third channels to determine the number which identifies the video source.

The video recorders of the first and combined second and third channels are preferably different video recorders.

BRIEF DESCRIPTION OF THE DRAWINGS

Figure 1 is a schematic block diagram of a multiplexer-type controller for a multi-camera surveillance system; and

Figure 2 is a schematic diagram of several different display configurations possible with the system of the invention.

DESCRIPTION OF AN EMBODIMENT

The block diagram of Figure 1 shows a multiplexer-type control system which selects the outputs of sixteen video cameras (or similar sources of video data) for display on a single video monitor 10, either singly or in a multi-screen format as a plurality of "cameos". In addition, the controller has an output for a video recorder, typically a video cassette recorder or VCR 12 which is able to record the outputs of the cameras and to play them back when required. Instead, or in addition, this output can be used to provide a signal for transmission to a remote site.

In order to provide a versatile control system, the invention provides a controller with three channels, one of which is a dedicated recording channel, and two further channels which can select between "live" and "playback" signals for simultaneous display on the monitor 10.

The recording channel of the controller has a 16 channel analog multiplexer 14 which is operated to select the outputs of the sixteen video cameras sequentially and to generate a time division multiplexed (TDM) output signal which effectively contains consecutively stacked fields from the respective cameras. The TDM process can be carried out by the video multiplexing system described in US 5,654,758 of Taylor et al, the contents of which are incorporated herein by reference.

The output of the analog multiplexer 14 is fed to a signal conditioning and anti-aliasing filter 16 and is then passed to a video decoder 18 where it is digitised. The digitised video data is written into a memory 20, typically VRAM, under the control of memory write control logic 22, and digital data,

such as the camera number which identifies the video source, is added to the video data by means of a teletext encoder 23.

Under the control of memory read control logic 24, the digital video signal is reconstructed to a standard analog video format in a video encoder 26 and sent via a VCR output 28 to the video recorder 12 (and/or is transmitted to a remote site).

It will be appreciated that if the video recorder 12 were a digital recorder instead of a conventional analog VCR, then the video encoding carried out by the video encoder 26 would take the form suitable for the intended digital recording medium.

Two further video channels are provided to permit the simultaneous display of live and playback video data, without interfering with the recording process of the first channel. These two channels comprise respective second and third analog multiplexers 30 and 32, each of which is connected to the video camera outputs. The outputs of the multiplexers 30 and 32 are fed to first inputs of respective 2:1 analog multiplexers 34 and 36, with the second input of each of the multiplexers 34 and 36 being connected to a VCR input 38 which is connected in use to an output of a video recorder. This may be the video recorder 12, or another recorder. A second VCR can be connected to the VCR input 38 if simultaneous record and playback is desired, or a read/write video recorder could be substituted for the two VCR's (ie. the video recorder 12 could be a read/write video recorder with an input connected to the VCR output 28 and an output connected to the VCR input 38).

Since each of the multiplexers 34 and 36 can switch between the VCR input 38 or the output of the respective input multiplexers 30 and 32, the signal which is fed to the monitor 10 can comprise either all live or all playback data, or a mixture of both.

Each of the multiplexers 30 and 32 selects the outputs of the cameras one to sixteen, and the secondary multiplexers 34 or 36 select either the outputs of the input multiplexers 30 and 32 or the VCR input 38. In either case, the outputs of the secondary multiplexers 34 and 36 are fed through respective signal processing and anti-aliasing filters 40 and 42 to video decoders 44 and 46 which digitise the video signals.

In either case, where a playback signal is selected via the VCR input 38, the recorded teletext data in the playback signal is decoded by a teletext decoder 48 to determine the source of the original signal (eg. the camera number). Each channel has respective memory write control logic 50 and 52 which controls the respective video decoders 44 and 46, and memory 54 and 56 which generates video signals (in a manner known as such) to generate the desired display for the monitor 10. The video signal for the monitor is read from the memories 54 and 56 via memory read control logic 58 which feeds the composite digital data from the memories to a video encoder 60 and a text generator 62, the output of which is a video signal fed via a main output 64 to the monitor 10.

Figure 2 shows schematically a number of different exemplary display formats which are possible using the system of the invention. In Figure 2a, eight playback cameo images are displayed above an equal number of live cameo images. In Figure 2b, two relatively large playback cameo images

are displayed, while eight live cameo images are displayed below them. In Figure 2c, three playback cameo images are displayed above six equivalently sized live cameo images. In Figure 2d, two playback cameo images are displayed above two equal sized live cameo images. In Figure 2e, a picture-in-picture (PIP) display is shown, with the full screen image being a playback image, and the PIP image being the live image.

It will be appreciated that the described system is highly versatile, in that it allows a combination of live and playback video data to be displayed in a user-selectable multi-screen format, while at the same time permitting uninterrupted simultaneous recordal of the live video data. Because it is not necessary to have multiple monitors, the cost of implementing the system is reduced, since it is not necessary to duplicate the multiplexer and monitor system to enable both live and playback viewing while recording simultaneously.

CLAIMS:

1. A method of operating a surveillance system having a plurality of video sources, a video monitor, and a video recorder, the method comprising:

selecting outputs of one or more desired sources;

feeding the selected outputs to a video monitor for display as a "live" video image;

feeding an output of a video recorder, corresponding to stored outputs of said one or more desired sources, to the monitor for simultaneous display as a "playback" video image; and

simultaneously feeding said selected outputs to a video recorder for recordal thereof.
2. A method of operating a surveillance system according to claim 1 wherein the video sources are video cameras.
3. A method of operating a surveillance system according to claim 1 further comprising the step of adding data which identifies the video source to the video output to enable the source of the output to be correctly identified.

4. A method of operating a surveillance system according to claim 3 wherein the selected outputs are displayed together, so that the video monitor displays both "live" and "playback" video images, each of which in turn comprises one or more camera outputs.

5. A controller for a surveillance system having a plurality of video sources, a video monitor, and a video recorder, the controller comprising:

first, second and third input multiplexer means each operable to select a desired one or more of the sources;

a first channel arranged to receive an output from the first input multiplexer means and to generate a video output signal for use by a video recorder; and

second and third channels each arranged to receive an output from either the second or third input multiplexer means, respectively, or an output of a video recorder;

wherein outputs of the second and third channels are combined in a common video output for use by a video monitor, so that the monitor can display both live and recorded video images while the data corresponding to the live images is recorded simultaneously.

6. A controller for a surveillance system according to claim 5 wherein each of the second and third channels comprises a secondary multiplexer for selecting between an output of the second or third input multiplexer means, respectively, or an output of a video recorder.
7. A controller for a surveillance system according to claim 5 wherein each channel further comprises a signal conditioning and anti-aliasing filter and a video decoder for digitising the output of the signal conditioning and anti-aliasing filter.
8. A controller for a surveillance system according to claim 7 wherein the first channel further comprises memory means into which the digitised data is written, and a teletext encoder for adding further digital data, which identifies the video source, to the video data.
9. A controller for a surveillance system according to claim 8 wherein the further digital data added by the teletext encoder is a number.
10. A controller for a surveillance system according to claim 9 further comprising at least one video encoder adapted to reconstruct the digital signal to a standard analog format before it is sent to the video recorder or video monitor.
11. A controller for a surveillance system according to claim 10 including a decoder adapted to decode the output of the video recorder to the second and third channels to determine the number which identifies the video source.

12. A controller for a surveillance system according to claim 5 wherein the video recorders of the first and combined second and third channels are different video recorders.
13. A method of operating a surveillance system substantially as herein described with reference to any one of the accompanying diagrams.
14. A controller for a surveillance system substantially as herein described with reference to any one of the accompanying diagrams.



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Claims searched: 1-14

Examiner: John Coules
Date of search: 30 September 1998

Patents Act 1977
Search Report under Section 17

Databases searched:

UK Patent Office collections, including GB, EP, WO & US patent specifications, in:

UK CI (Ed.P): H4F FAAE,FAAX,FDX

Int CI (Ed.6): H04N 7/18

Other:

Documents considered to be relevant:

Category	Identity of document and relevant passage	Relevant to claims
A	GB 2319422 A (Hall)	
X	WO 92/11614 A1 (Katz) see whole doc	1 and 5 at least
X	US 4630110 (Supervision Control) see whole doc	1 and 5 at least

X Document indicating lack of novelty or inventive step
Y Document indicating lack of inventive step if combined with one or more other documents of same category.
& Member of the same patent family

A Document indicating technological background and/or state of the art.
P Document published on or after the declared priority date but before the filing date of this invention.
E Patent document published on or after, but with priority date earlier than, the filing date of this application.